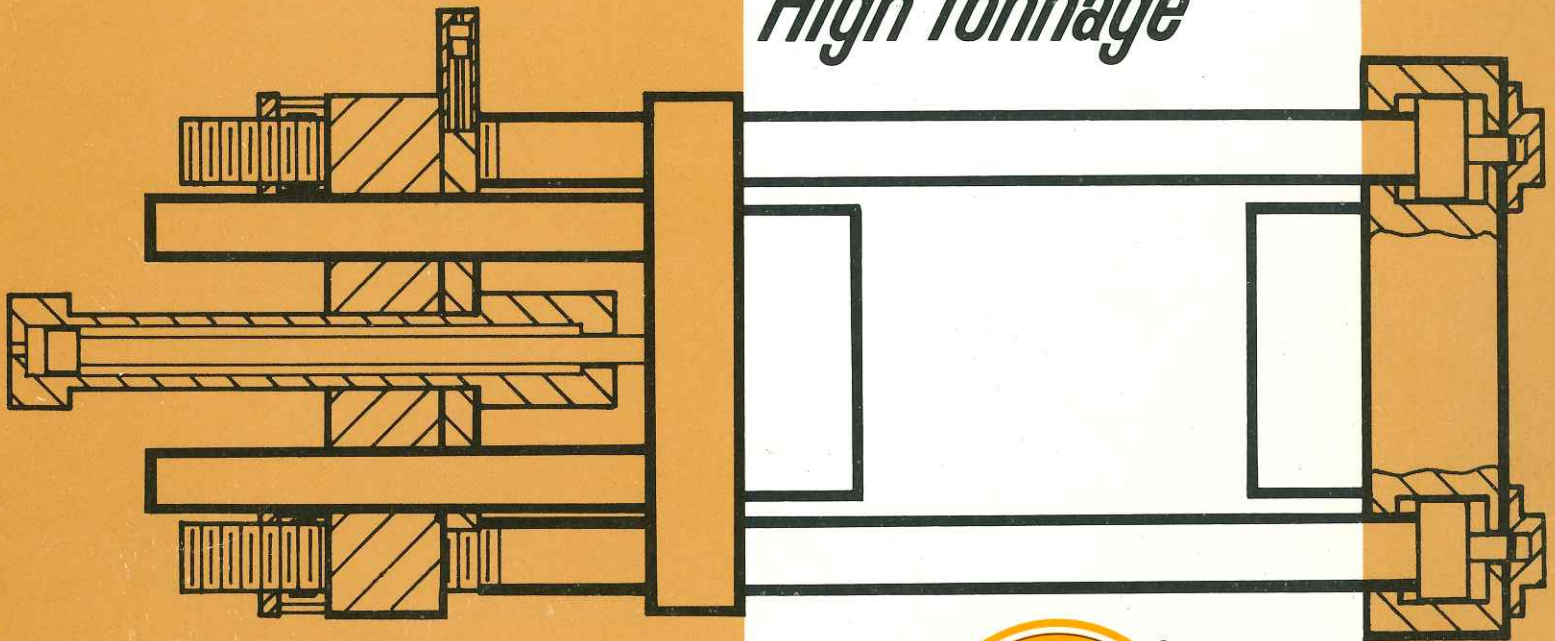


425-Dig 223

*The incredibly fast,
High Tonnage*



**HYDRO-MECHANICAL
CLAMP**

**PLASTIC
INJECTION
MOLDING
MACHINES**

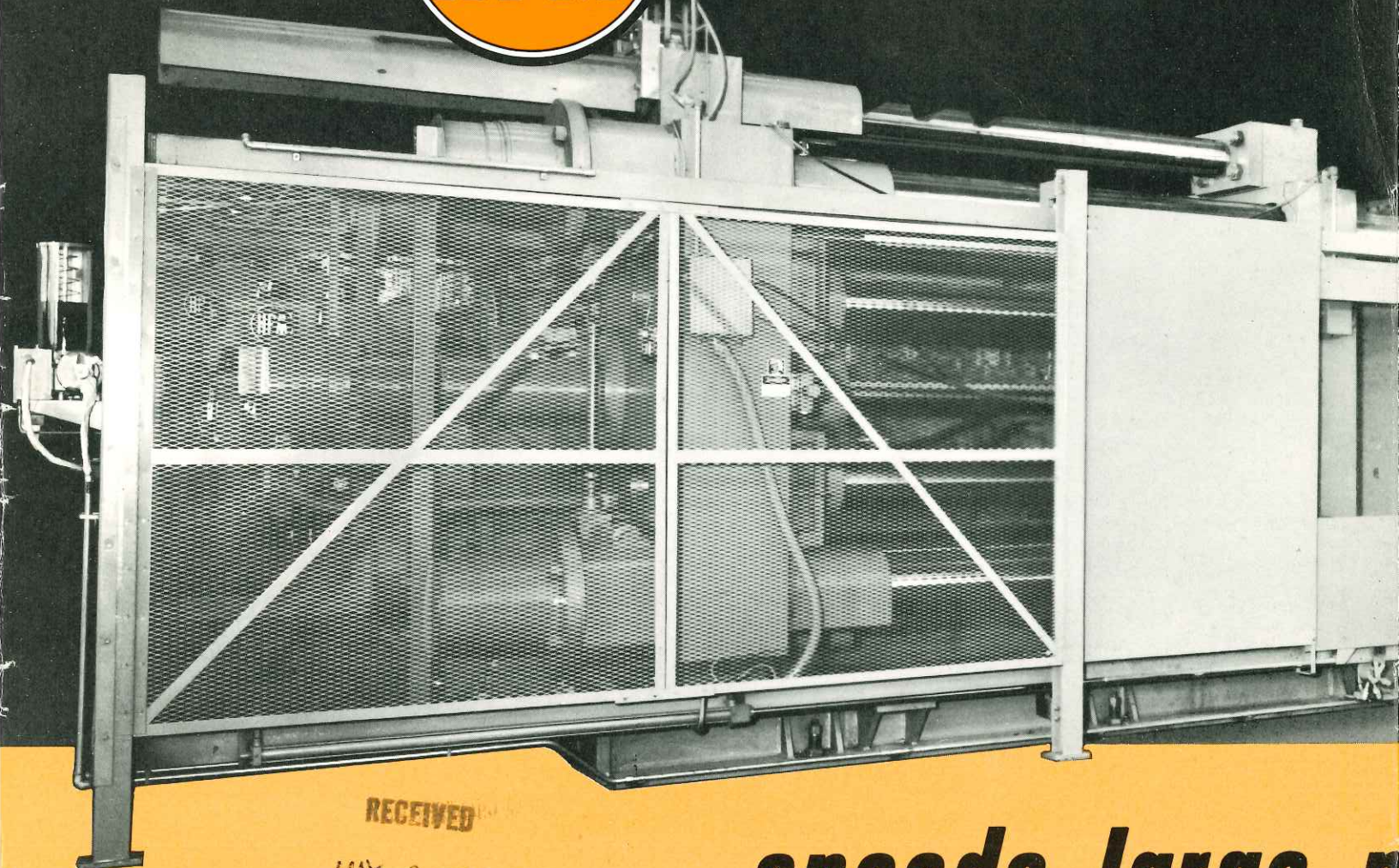


Koehring
HPM Division
Mount Gilead, Ohio 43338

New



HYDRO-MECH



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GROUP 320

...speeds large p

The big problem in molding large plastic parts, as used in the automotive, housewares and appliance industries, has been to reduce the cycle time of injection machines to rates comparable with machines making metal stampings and other methods of parts production.

With plastic injection machines, it has always been a compromise between high tonnage clamps and fast cycle rates. The two have never been compatible. To get necessary tonnage, speed had to be sacrificed. HPM's new hydro mechanical clamp injection machine, with heavy tonnage clamping force, meets this problem.

The entirely new clamping principle of the hydro-mechanical clamp speeds clamp closing and opening to rates that until now were possible only on smaller machines. Closing and opening rates are up to 50% faster than on comparable machines with conventional hydraulic clamps. The new clamp also provides high breakaway tonnage without sacrificing opening speeds.

The hydro-mechanical clamp means flexibility for the

purchaser. Any daylight and stroke can be furnished at minimum cost because there are no costly castings to modify. Spacers are eliminated—a simple hydraulic control makes daylight adjustment easy. Both hydraulic ejector and core pull system are available. The standard ejector is provided with both horizontal and vertical knockout patterns. The core-pull system (optional) is equipped with two sequences of operation. Core speeds and pressures are easily adjusted.

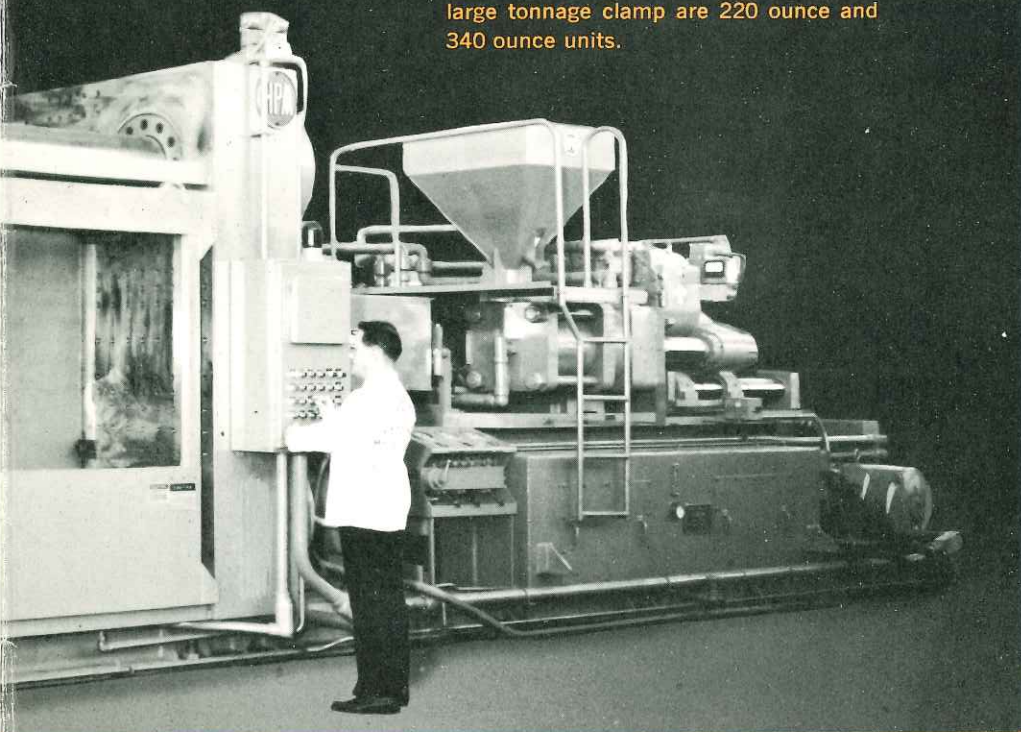
The HPM Hydro Mechanical Clamp principle can bring an entirely new era to large part injection molding.

The hydraulic system employs a small traverse ram which opens and closes molds at high speeds. The traverse ram closes the mold to within a fraction of an inch. At this point, oil volume is diverted to four short stroke cylinders to accomplish final close and develop tonnage. The four cylinders, one located on each of the tie rods, give a side advantage of even load distribution.

The new principle involves the use of four compression

MECHANICAL CLAMP

HPM 2500 ton hydro mechanical clamp plastics injection molding machine. Standard injection units available for this large tonnage clamp are 220 ounce and 340 ounce units.



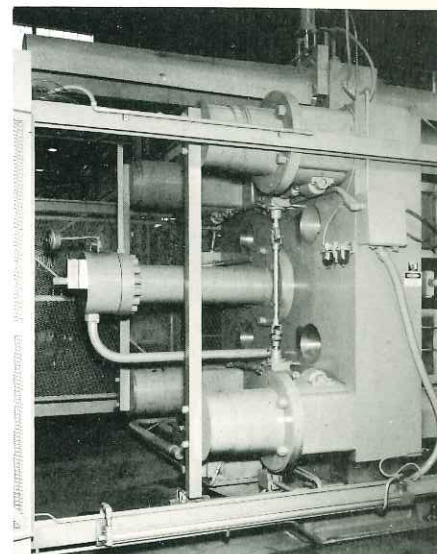
parts production

columns and a lock plate. In order to build tonnage, the lock plate slides into position, forming a base for the compression columns. At this point, pressure applied to each of the cylinders on the ends of the tie rods causes the rods to move forward for a final short stroke, closing and building tonnage on the mold. The tie rods pull the back plate towards the stationary platen. This causes the compression columns to push against the moving platen and build tonnage on the mold. High tonnage and quick pressure build-up is reached with relatively small hydraulic capacity.

Breakaway tonnage is developed by four small pusher rams, one located on the end of each tie rod. Pressure applied to these ram reverses the back plate, releases the force on the compression columns and provides break-away tonnage.

After the mold is separated, the lock plate is moved to its open position. Pump volume is now diverted from the pusher rams to the traverse cylinder for high speed clamp opening. The clamp opens to an adjustable reverse stop position.

Close-up view of the HPM hydro mechanical clamp showing small traversing cylinder located in the center of the back plate. This cylinder opens and closes the mold at high speeds. Also shown is the hydraulic motorized die height adjustment mechanism which is controlled from the operator's control station. The mechanism shown on top of the machine is the mechanical safety bar. The lock plates, which form a base for the compression columns to build pressure, are located on the other side of this plate.

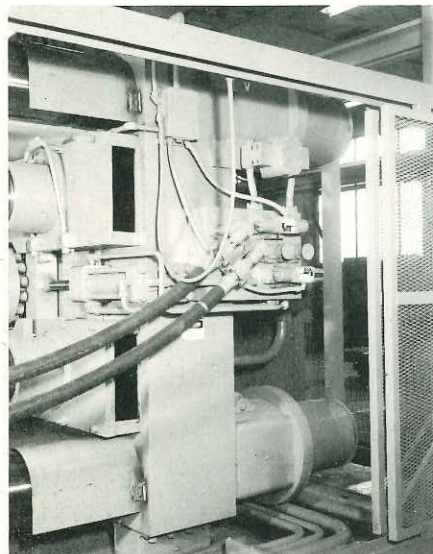


OPERATIONAL SEQUENCE

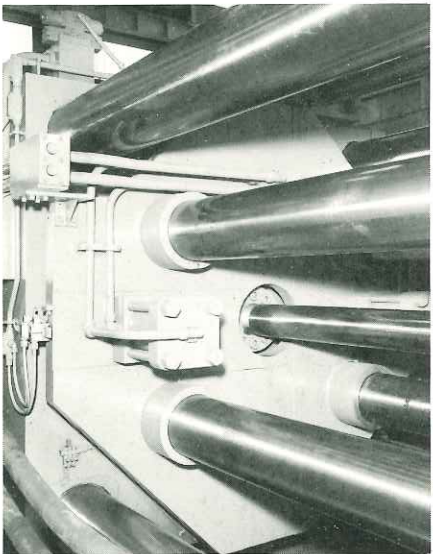
1. MOVING PLATEN closes with pressure on small diameter TRAVERSING CYLINDER. The cylinder bottoms, allowing COMPRESSION COLUMNS to clear the LOCK PLATE.
2. With clamp closed, the SLIDING LOCK PLATE moves into position.
3. With LOCK PLATE in position, pressure is introduced in the differential area of the FOUR MAIN CYLINDERS. Force is transmitted through the TIE RODS, BACK PLATE and COMPRESSION COLUMNS to the PLATEN for final slow close and clamp tonnage build-up.
4. For initial mold opening (breakaway), pressure is introduced to the PUSH-BACK CYLINDER heads. This pressure also moves the BACK PLATE ASSEMBLY to provide clearance between COLUMNS and the LOCK PLATE.
5. LOCK PLATE slides to clear position and clamp retracts fully.

DIE HEIGHT ADJUSTMENT. Hydraulic motor drives the TIE ROD NUT along the THREADED TIE ROD for adjustment.

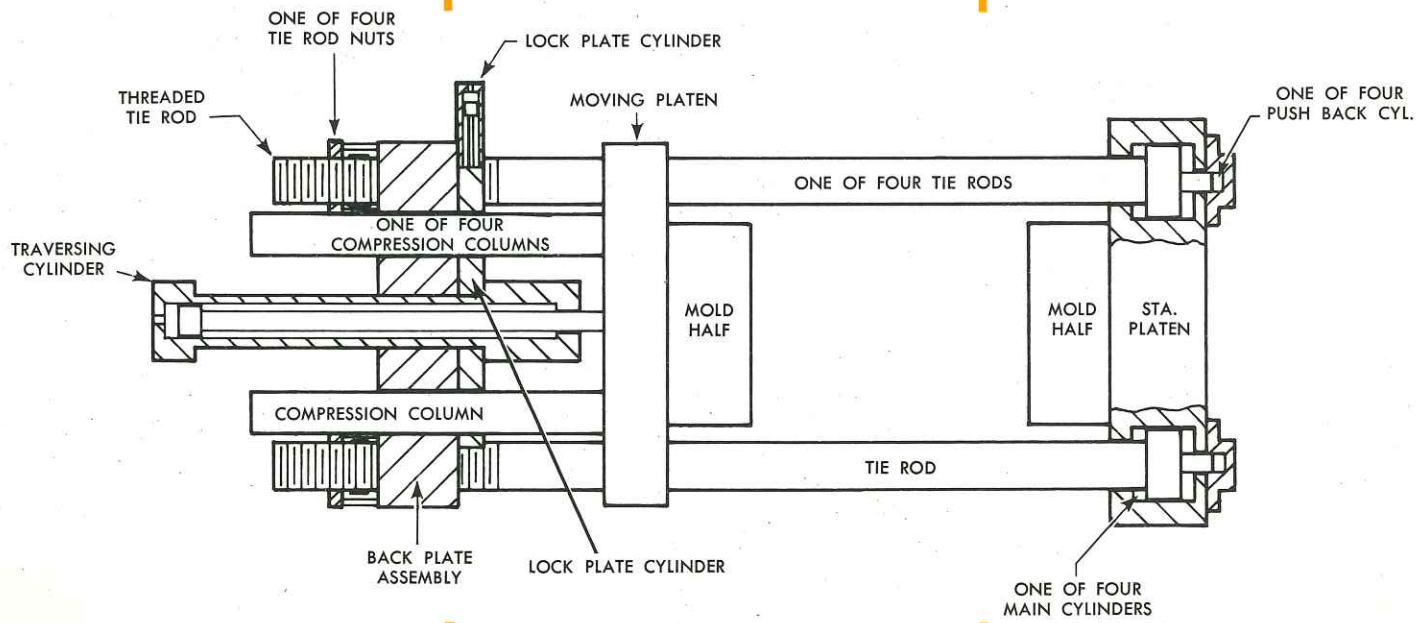
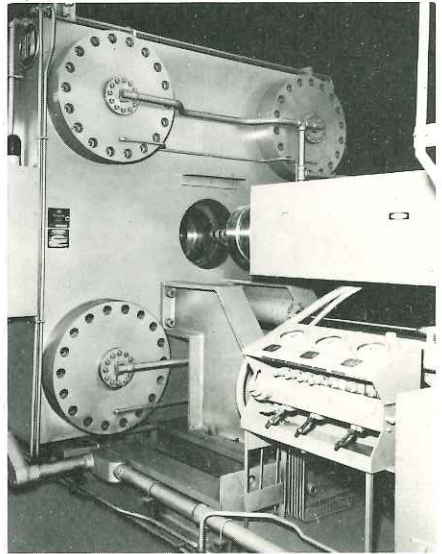
Located on the front side of the back plate, just below the upper and above the lower tie rods, are guides in which two lock plates slide in and out of position behind the compression columns. They are moved by the hydraulic cylinder shown between them.



Hydraulic ejector plate which covers both vertical and horizontal S.P.I. knock-out patterns.



Shown here are the cylinders located on the end of each tie rod. They move for a short stroke inside the bores in the stationary platen. When pressure is applied to each of these four cylinders after the mold is almost closed by the small high speed traversing cylinder, the tie rods move forward closing and building maximum tonnage on the mold. For mold breakaway, small pusher rams shown in the center of the main cylinders on the end of the tie bars push the bars out of the stationary platen.



SPECIFICATIONS

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HPM MACHINE MODEL NO.	1500-IX-140 H-M		1500-IX-220 H-M		2500-IX-220 H-M		2500-IX-340 H-M	
	MEASUREMENT		MEASUREMENT		MEASUREMENT		MEASUREMENT	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
CLAMPING UNIT								
Clamp Force (Tons)	1500	1360	1500	1360	2500	2265	2500	2265
Clamp Opening Force (Tons)	94.5	85.4	94.5	85.4	150	135.9	150	135.9
Clamp Stroke Max. (in., mm.)	60	1523	60	1523	65	1651	65	1651
Open Daylight (in., mm.) Max.	110	2792	110	2792	120	3048	120	3048
Closed Daylight (in., mm.) Min.	20	508	20	508	20	508	20	508
Platen Dimensions—Horizontal x Vertical (in., mm.)	78 x 78	1980 x 1980	78 x 78	1980 x 1980	86 x 86	2184 x 2184	86 x 86	2184 x 2184
Distance Between Tie Rods—Horizontal x Vertical (in., mm.)	52½ x 52½	1334 x 1334	52½ x 52½	1334 x 1334	55½ x 55½	1410 x 1410	55½ x 55½	1410 x 1410
Tie Rod Diameter (in., mm.)	9½	241	9½	241	11½	292	11½	292
Ejector Knockout—Force (Tons) (Hydraulic)	62.8	57	62.8	57	76.5	69	76.5	69
Stroke (in., mm.)	9	228.2	9	228.2	9	228.2	9	228.2
Pattern (SPI Specs.—Vertical x Horizontal)	V & H		V & H		V & H		V & H	
INJECTION PLASTICIZING UNIT								
Injection Capacity (cu. in., cu. cm.)	254.5	4176	390	6390	390	6390	590	9669
Injection Capacity—G. P. Polystyrene (oz., gm.)	140	3969	220	6240	220	6240	340	9639
Plasticizing Capacity—Cont. G. P. Polystyrene (lb./hr., kg./hr.)	800	362	1200	545	1200	545	1500	680
Recovery Rate—G. P. Polystyrene SPI Test Procedure (oz./sec., gm./sec.) (Estimated)	3.56	100.7	5.35	152	5.35	152	6.6	185.5
Injection Pressure—Max. Adjustable (psi, kg/sq. cm)	20,000	1404	20,000	1404	20,000	1404	20,000	1404
Injection Rate—Max. at Max. Pressure (cu. in./sec., cu. cm./sec.)	95	1557	95	1557	125	2048	124	2032
Injection Stroke—Max. (in., mm.)	16	406	18	457	18	457	21	533
Screw Diameter (in., mm.)	4½	114.2	5¼	133.3	5¼	133.3	6	152.4
Barrel L/D Ratio	20:1	20:1	20:1	20:1	20:1	20:1	20:1	20:1
Screw Speed Range (rpm)	100/55	100/55	90/50	90/50	118/98	118/98	88/55	88/55
Torque (in.-lbs., mm.-kg.)	63,800 to 66,200	736,000 to 764,000	86,300 to 89,000	997,000 to 1,028,000	79,000 to 94,500	910,000 to 1,088,000	97,000 to 149,000	1,117,000 to 1,716,000
Total Rated HP	257.5	257.5	257.5	257.5	450	450	450	450
MACHINE DIMENSIONS								
Length (in., mm.)	NOT AVAILABLE AT TIME OF PRINTING		488 49'	12,395	570	14,478	578	14,581
Width (in., mm.)			140 11'	3,556	138	3,505	138	3,505
Height (in., mm.)			113 9'	2,869	114	2,894	117	2,972
Weight (lbs., kg.)			200,500	90,635	284,000	127,800	291,000	130,950

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